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Negative Overnight Returns: China's security markets

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Abstract

We find that there exist statistically significant negative overnight returns in China's security markets, which is totally different from the previous research on HS300 Index by He et al. (2013), and the negative overnight returns are comparatively larger in China's GEM (Growth Enterprise Market) board and SME (Small and Medium Enterprise) board than in the mainboards of Shanghai and Shenzhen security markets. We also find some of the SWS Primary Sectors have negative overnight returns after ticking out of market effects, which can be a great guide for investing in hedging portfolios of specific sectors.

1. Introduction

The overnight period is time for information gathering and thus the opening price of a stock tomorrow is usually different from its closing price today. There are many news releases occurring during non-trading hours, Corral et al. (2003) find in the U.S. stock markets, 93% of the profit-related announcements were public after trading hours[1]. And investors can make their decisions by observing executed trades, especially retail investors who are easy to be attracted by attention-grabbing stocks according to Barber et al. (2008)[2]. When trading starts in a new day, the information accumulated will be reflected immediately on the opening prices [3]. Brock et al. (1992) show that the portfolios optimized at the close time will not be the optimum portfolios at the open next day because of the large amount of information accumulated during the non-trading night, which makes the markets more volatile during the trading hours the next day [4].

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The present studies have grown out of many results of the U.S. market. Berkman et al. (2012) found that there are positive returns during the overnight period by examining 3000 largest U.S. stocks in the NYSE market during 1996-2008[5]. Some studies concentrated on the relationship of overnight return and subsequent intraday return, for instance, Branch et al. (2008) find the overnight return is negatively correlated with subsequent trading day return, which is also proved by Berkman et al. (2012)[5-6]. In China, Liu and He (2012) pointed out that the overnight effects are significant since he made regressions of 30-minute SSE Composite Index and SZSE Component Index returns on 8 time period dummy variables [7]. He and Zhao (2013) expand the results to HS300 Index using the same method as Liu and He (2012), and they came to the result of positive overnight returns in China's security markets [8]. However, the lack of insight to individual stock performances and the characteristics of different boards of China's security markets prevent us from making actual trading decisions for excess returns. Moreover, analysis of overnight returns of different sectors is not enough to provide evidence for choosing portfolios. In this paper we make three contributions. First we test the HS300 Index overnight returns during 2005-2014, showing that China's stock markets have statistically significant negative overnight returns over this period, which makes the results of positive overnight returns of HS300 Index in previous research need reconsideration. Next we separate China's security markets into Shanghai mainboard, Shenzhen mainboard, SME (Small and Medium Enterprises) board and GEM (Growth Enterprise Market) board according to the market size. We carry out testing the overnight returns of these four markets every year and over the 10-year period, and find there are stable negative overnight returns in the GEM board and SME board, together with higher returns in these two boards than the other two. This may imply that stocks with small market value and low liquidity perform well near close time, while their prices drop down after one night when trading starts on the next day. Thirdly, we derive a regression of overnight returns of the 28 SWS Primary Sectors on the HS300 Index overnight returns. We treat HS300 Index overnight returns as the market returns, and get the result that in some sectors there are significant excess market returns. As a robustness test we conduct a test on the SWS Primary Sector indexes using the same regression model, and get the consistent result.

2. Sample selection and variable construction

The security markets of Shanghai and Shenzhen have experienced great changes since 2005, that is, firms have been forced to start reform of non-tradable shares, so we choose the period from Jan 1st, 2005 to Aug 7th, 2014 for HS300 Index, the mainboards of Shanghai and Shenzhen and SME board, 2572 trading days in total. The GEM board first opened on Oct 30th, 2009, so we use its price data from Oct 30th, 2009 to Aug 7th, 2014 with totally 1159 trading days.

We calculate overnight returns using daily opening price and closing price data from WIND[1]. These opening prices and closing prices have been adjusted for stock splits and dividends before computing daily overnight returns by WIND. The overnight return of day t (CTO_t) is defined as the ratio of opening price of day t ($Open_t$) on closing price of day $t-1$ ($Close_{t-1}$) minus one. It can be written as follows:

$$CTO_t = Open_t / Close_{t-1} - 1 \qquad (1)$$

As for the effectiveness of t-statistics, we should first calculate the cross-sectional average overnight returns of all the stocks in a specific board or sector each day, and then take the time series average returns of these cross-sectional overnight returns over a specific period just as Berkman et al. (2012). We base our t-statistics

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[1]WIND is one of the most widely used database for China's security markets and we use it for the daily opening, closing and pre-closing prices from Jan 4th, 2005 to Aug 7th, 2014 to calculate overnight returns.

on these time series returns instead of using standard t-statistics as there are cross- correlations between stocks in the same date [9].

3. Descriptive Statistics

3.1. HS300 Index

Table 1 shows the overnight returns of HS300 Index over the whole 10-year period and every year. The first row shows the *CTO* of the whole period, with daily and annual *CTO* and t statistics based on daily *CTO*. The overnight return is the average of the time series HS300 Index *CTO* of all trading days. And the rest of Table 1 gives the daily and annual overnight returns each year in the period. All the annual returns are annualized by the daily returns using 242.5 trading days per year. We can see that over the whole period of 2005-2014, the overnight returns of HS300 index is significantly negative. This is a totally different result from the research of He et al. (2013), which showed HS300 Index has significantly positive overnight returns over 2005-2012. It is perhaps because the variable we choose is defined by two inter-temporal prices while they care about the 30-minute returns of HS300 index in a day. It is obvious that negative returns exist in most years except 2006, 2007, 2009 and 2010. Compared to Figure 1 which illustrates the index trend in the 10-year period using closing prices, we find that the overnight returns are positive in 2006 and 2007 along with the sharp increase of the HS300 Index, but they are not significant. And in 2009 and 2010 there also existed an obvious increase of the index, in the meantime the overnight returns get insignificant. A possible explanation may be that negative overnight returns have an internal correlation to the downward trend of HS300 Index. In a great bull market, it is more likely that the overnight information is good enough to positively stimulate the opening price next day. However HS300 Index is composed of stocks mostly with large market value which cannot represent medium and small stocks very well. So then we turn to see if the results get any difference in different boards of China's security markets.

3.2. Four boards of China's security markets

We separate our analysis into four boards: mainboard of Shanghai, mainboard of Shenzhen, SME board and GEM board. The first row tells us about the average daily overnight return and t statistics related during the whole period we choose for each board. The rest of Table 2 shows the average daily *CTO* and t statistics of each year in the chosen period. And all the average *CTOs* are calculated using the time series of daily *CTO*. Taking the GEM board as an example, the average daily *CTO* in 2009 is -0.643%, to get which we first calculate the *CTO* of every listed company on GEM board on every trading day in 2009, and take the mean *CTO* of all the listed companies with non-zero opening price each trading day as a time series, which we call it cross-sectional time series *CTO*. Then -0.643% is the average of this time series *CTO*, and the t statistics are based on the cross-sectional time series *CTO* as well. The same algorithm is for all the listed daily overnight return data in Table 2.

Table 1. HS300 Index Overnight Returns

	HS300 Index		
year	daily CTO	annual CTO	t statistics
all year	-0.070%	-15.66%	-4.487
2005	-0.034%	-8.02%	-2.076
2006	0.000%	0.11%	0.018
2007	0.004%	0.85%	0.06
2008	-0.235%	-43.41%	-2.242
2009	-0.029%	-6.86%	-0.605
2010	-0.081%	-17.93%	-1.986

year				
2011	-0.108%	-23.04%	-2.813	
2012	-0.081%	-17.76%	-3.442	
2013	-0.063%	-14.16%	-2.172	
2014	-0.073%	-16.23%	-3.336	

Table 2. Overnight returns on different boards

year	GEM Board		SME Board		Shanghai mainboard		Shenzhen mainboard	
	daily CTO	t statistics	daily CTO	t statistics	daily CTO	t statistics	daily CTO	t statistics
all year	-0.206%	-10.867	-0.132%	-9.412	-0.111%	-7.486	-0.097%	-6.572
2005	--	--	-0.109%	-3.066	-0.138%	-6.709	-0.183%	-8.314
2006	--	--	-0.074%	-2.867	-0.015%	-0.648	-0.027%	-1.117
2007	--	--	-0.034%	-0.726	0.041%	0.675	0.072%	1.174
2008	--	--	-0.264%	-2.885	-0.259%	-2.641	-0.234%	-2.529
2009	-0.643%	-2.559	-0.100%	-2.494	-0.060%	-1.439	-0.021%	-0.435
2010	-0.245%	-5.199	-0.182%	-5.239	-0.146%	-4.111	-0.131%	-3.629
2011	-0.209%	-5.059	-0.181%	-4.772	-0.184%	-4.91	-0.156%	-4.336
2012	-0.173%	-6.555	-0.150%	-6.422	-0.133%	-5.87	-0.118%	-4.826
2013	-0.175%	-5.020	-0.122%	-5.534	-0.108%	-5.362	-0.078%	-3.254
2014	-0.112%	-4.643	-0.086%	-4.956	-0.094%	-6.078	-0.085%	-5.52

The result for GEM board in Table 2 is so good that from 2009 to the early half year of 2014, the overnight returns for GEM board is steadily negative with significance every year. The average daily overnight returns of all stocks in GEM board is approximately -0.206%, and the return came to -0.643% in 2009 when the GEM board first opened, while it decreased year by year to about -0.112% in 2014. Similarly, the overnight returns of SME board are significantly negative over this period, with an annual average return of -0.132%, lower than 3/4 of that of GEM board. Except for 2007, the average daily overnight return every year is also negative significantly. As a comparison, the two mainboards only get overnight returns of -0.097% for Shenzhen and -0.111% for Shanghai, being about half of the returns of GEM board. Another thing is that their performances are similar to that of HS300 Index with positive returns in 2007 and insignificant data in 2006, 2007 and 2009. In contrast to stocks in GEM board and SME board, mainboard stocks mostly have larger market value which is consistent with the component stocks of HS300 Index, so we are not surprised that they perform similarly to it. And according to the diminishing overnight returns from GEM board to mainboards together with increasing market size and market value, probably the magnitude of overnight returns is negative related to the size and value of markets. We can try to understand it like this: stocks in GEM board have lower liquidity, and since their size and market value are small, they have more chance to be manipulated by market makers. The closing price may be driven up so that market makers get great profits and the next day when individual investors herd to sell the stocks, it becomes difficult so they fall into panic with lower asking price. But as the mainboard stocks have good liquidity and it is hard to manipulate prices, the overnight returns are much smaller.

3.3. SSE50 Index

As we discussed above, stocks with large market value and size may have less significance and smaller negative overnight returns. To provide more evidence for this, we then give an insight to the performance of the overnight returns of SSE50 Index. SSE50 Index has the largest 50 stocks of good liquidity and representativeness from Shanghai security market by scientific and objective method. According to our analysis for HS300 Index and the mainboards of Shanghai and Shenzhen security markets, the overnight returns of SSE50 Index are assumed to be not significantly negative in great bull market, say the year 2007 at least. The results are showed in Table 3. In the whole period from year of 2005 to the early half year of 2014, SSE50 Index has significantly negative daily overnight returns of -0.061%, which is even much less than the overnight returns of mainboards, just about one fourth of that of the GEM board. Next we examine the overnight performance of SSE50 Index each year, in 2006 and 2007 the overnight returns are slightly positive, but not

Fig. 1. HS300 Index Trend

Fig. 2. SSE50 Index Trend

significant, and there is 70% of the whole period with overnight returns insignificant. These results are as expected to provide evidence for the reasonability of our explanation that market size have something with the overnight return magnitude. We illustrate the index closing prices in Figure 2. The curve is just similar to HS300 Index curve, demonstrating the 2006-2007 great bull market may be an explanation for the positive anomalies of overnight returns.

Table 3. SSE50 Index Overnight returns

	SSE50 Index		
year	daily CTO	annual CTO	t statistics
all year	-0.061%	-13.84%	-3.727
2005	-0.028%	-6.57%	-1.367
2006	0.013%	3.28%	0.532
2007	0.008%	1.86%	0.130
2008	-0.235%	-43.44%	-2.122
2009	-0.017%	-4.05%	-0.334
2010	-0.071%	-15.87%	-1.607
2011	-0.086%	-18.87%	-2.214
2012	-0.068%	-15.30%	-2.943
2013	-0.059%	-13.44%	-1.738
2014	-0.070%	-15.59%	-2.777

4. SWS Primary Sector: Excess market return & Hedging portfolios construction

4.1. Excess market return for SWS Primary Sector Stocks

We consider if negative overnight returns significantly existed across various sectors. SWS Primary Sector is chosen for the test because it is widely used and committed in China as the method to classify stocks according to sectors. For each of the 28 sectors, we give their constituent stocks equal weight when calculating average overnight returns. We denote $R_{t,i}$ to indicate the simple average of the *CTOs* of all the constituent stocks of the ith sector with non-zero opening price on day t, and $R_{m,t}$ to stand for the overnight returns of HS300 Index on day t, also as the market overnight return. Then we can write the regression function as:

$$R_{i,t} = \alpha_{i,t} + \beta_{i,t} \times R_{m,t} + \varepsilon_{i,t} \tag{2}$$

We derive this regression in order to know that, if we tick out the effects of market overnight returns on sector overnight returns can we still get significant *CTOs* in different sectors? In the other word, we want to see if the alpha returns in this regression are significantly negative. We show the results year by year of each sector in Table 4. For each sector we list the annual alpha return and beta coefficient each year and over the whole period together with the adjusted R^2. It is significant for all the beta coefficients listed in Table 4, and we use the number of stars following alpha data to show their significance. 3-starred alpha has the 1% confidence level, with 2-starred ones having the 5% level and 1-starred ones having the 10% level, and no star means insignificant.

From these dazzled results, we come to a conclusion that the overnight returns for some sectors are statistically significantly negative even without market effects, but not for all. For example, in the sector of Light Industry Manufacturing sector, overnight returns taken out market effects are negative significantly every year except 2007; however in the Bank sector, we cannot find out apparent significance of alpha returns, neither can we say if the alpha returns are negative or positive. Those sectors with significant negative alpha returns may have power over market to explain for that, and for those similar to the Bank sector, market power dominates their overnight returns, so it is difficult to get excess overnight returns. Another reason is, we use HS300 Index as the market indicator, but the ratio of stocks of each sector accounting for the constitution of HS300 Index is not equal at all and volatile with time. Another thing is, we observe several extreme points in the table. First is the 2007 alpha return of the Building Materials sector, which comes to 56% per annum, far more than other sectors with an overnight return of less than 20% in the same year. And this positive alpha return is significant at the 10% confidence level. We plot the closing prices of Building Materials Sector Index in the same period in Figure 3, finding that in the year 2007, the closing prices increased almost like a vertical line. This indicates that the Building Materials sector experienced a great development in 2007, and overnight information during that year is a great positive incentive probably so as to make this sector go far above the market performance. The second extreme overnight return is in the Non-bank Financial sector. Just like the Building Materials sector, the overnight return in 2007 of Non-bank Financial sector went far more than the average of all sectors after taking out of market effects, getting to a positive number of 127% per annum. However, since the Non-bank Financial sector itself does not have significant alpha returns in most years and the constituent stocks have large market value, this result is within expectation. In the 2007 great bull market, almost every stock went through tremendous price rising, even the overnight returns took account for an important role in this booming.

Table 4. SWS Primary Sector Stocks' Simple Average

year	alpha	beta	R^2	alpha	beta	R^2	alpha	beta	R^2	alpha	beta	R^2
	Transportation &			Catering & Tourism			Media			Public Utility		
2005	-0.1439	1.11	0.74	-0.3178	1.09	0.43	-0.292 **	1.20	0.53	-0.1775	1.12	0.66
2006	0.0352	0.77	0.70	-0.1461	0.86	0.49	-0.1384 **	0.97	0.47	0.0115	0.74	0.68
2007	0.0897 *	1.00	0.89	-0.1077	0.83	0.50	-0.0927	0.89	0.59	0.2379 ***	1.00	0.78
2008	0.0752	0.92	0.96	-0.4167	0.85	0.86	-0.2341	0.83	0.90	0.1703 ***	0.88	0.91
2009	-0.0189	0.78	0.87	-	0.77	0.70	-0.163 ***	0.76	0.78	0.0904	0.70	0.34
2010	-0.1123	0.75	0.86	-0.2294	0.71	0.66	-0.1945	0.71	0.69	-0.1176	0.73	0.83
2011	-0.0839 **	0.77	0.82	-0.2122	0.82	0.81	-0.1254	0.90	0.75	-0.1779	0.89	0.86
2012	-0.075	0.73	0.73	-0.1324	0.73	0.56	-0.0925	0.94	0.10	-0.1209	0.76	0.68
2013	-0.1301	0.49	0.45	-0.1855	0.53	0.36	-0.2591	0.66	0.26	-0.0952	0.61	0.60
2014	-0.1718	0.60	0.58	-0.1069 **	0.60	0.35	-0.1237 **	0.75	0.37	0.0038	0.54	0.52
	Agriculture			Chemical			Medical Biology			Commerce & Trade		
2005	-0.2363	1.04	0.59	-0.2061	1.14	0.75	-0.2332	1.08	0.64	-0.2367	1.01	0.68
2006	-0.0425	0.79	0.48	-0.0428	0.80	0.65	-0.04	0.74	0.61	-0.0873 **	0.88	0.65
2007	-0.1171 *	0.93	0.80	0.0705	0.97	0.82	0.1618	0.92	0.62	-0.0217	1.00	0.81
2008	-0.1247	0.86	0.48	-0.1384	0.92	0.97	-0.0818	0.87	0.94	-0.1281	0.86	0.95
2009	-0.1538	0.78	0.78	-0.1777	0.83	0.90	0.003	0.65	0.68	-0.1266	0.80	0.90

Year												
2010	-0.1831	0.79	0.73	-0.2082	0.78	0.83	-0.2262	0.69	0.69	-0.1874	0.74	0.85
2011	-0.1897	0.96	0.85	-0.2032	0.97	0.89	-0.187 ***	0.87	0.87	-0.1758	0.84	0.89
2012	-0.196 ***	0.91	0.69	-0.1715	0.88	0.78	-0.1764	0.79	0.75	-0.1391	0.83	0.79
2013	-0.2052	0.54	0.44	-0.2118	0.56	0.57	-0.1496	0.45	0.25	-0.1609	0.54	0.57
2014	-0.182 ***	0.45	0.36	-0.1358	0.61	0.61	-0.0856	0.60	0.54	-0.1124	0.64	0.67

	National Defense			Electrical Household			Building materials			Architectural decoration		
2005	-0.2696	1.20	0.48	-0.2047	1.04	0.41	-0.3565	1.12	0.45	-0.2661	1.01	0.50
2006	0.0073	1.24	0.40	-0.0662	0.70	0.43	-0.1255	0.91	0.54	-0.0823 *	0.74	0.42
2007	0.1137	0.81	0.69	0.0962	0.88	0.71	0.5652 *	0.88	0.22	0.1608 *	0.92	0.71
2008	0.0099	0.89	0.89	-0.0537	0.86	0.90	0.0092	0.92	0.89	0.08	0.91	0.94
2009	-0.1364	0.80	0.75	0.017	0.79	0.70	-0.095 **	0.75	0.82	-0.0412	0.80	0.87
2010	-0.1093	0.75	0.44	-0.176 ***	0.73	0.60	-0.1908	0.77	0.74	-0.1539	0.76	0.80
2011	-0.1517	0.99	0.83	-0.1547	0.94	0.85	-0.2417	1.03	0.87	-0.1126 **	0.97	0.75
2012	-0.0915	0.83	0.38	-0.0944	0.86	0.72	-0.1796	1.01	0.65	-0.0722 **	0.98	0.73
2013	-0.0704	0.63	0.26	-0.1845	0.58	0.50	-0.1259	0.70	0.62	-0.0069	0.65	0.58
2014	-0.0252	0.71	0.23	-0.0894 **	0.66	0.47	0.0044	0.70	0.54	-0.0138	0.59	0.55

	Property			Nonferrous Metal			Machinery equipment			Car		
2005	-0.2866	1.11	0.55	-0.2694	1.17	0.60	-0.2521	1.13	0.67	-0.3407	1.02	0.49
2006	-0.1354	0.85	0.60	-0.0405	1.17	0.42	-0.0534	0.98	0.69	-0.0056	0.84	0.53
2007	0.137	0.93	0.74	0.1347 *	0.99	0.81	0.1586 *	0.94	0.74	0.1457	0.89	0.56
2008	-0.1123 *	0.91	0.92	-0.2127	0.91	0.92	-0.0722	0.92	0.95	-0.0085	0.88	0.95
2009	0.1664	0.92	0.27	-0.1269 *	1.19	0.80	-0.1537	0.79	0.89	-0.1145	0.80	0.81
2010	-0.3285	0.84	0.74	-0.1185 **	1.16	0.78	-0.199 ***	0.79	0.83	-0.1314	0.80	0.71
2011	-0.2176	0.91	0.73	-0.1597	1.21	0.90	-0.2196	0.98	0.90	-0.1769	0.92	0.89
2012	-0.2077	0.99	0.72	-0.086 *	1.31	0.68	-0.156 ***	0.92	0.78	-0.1496	0.79	0.72
2013	-0.1194	0.75	0.61	-0.121 **	0.76	0.46	-0.1846	0.58	0.54	-0.1242	0.58	0.19
2014	-0.1078	0.61	0.52	-0.101 *	0.65	0.28	-0.1479	0.62	0.57	-0.0504	0.68	0.48

	Electronic Component			Electric equipment			Textile & Clothing			Miscellaneous		
2005	-0.1838	1.20	0.56	-0.2197	1.16	0.59	-0.2712	1.18	0.45	-0.3131	1.06	0.46
2006	-0.0727 **	0.88	0.65	-0.0636	0.96	0.66	0.029	0.86	0.58	-0.084 **	0.86	0.56
2007	-0.0713	0.85	0.70	0.0891	0.88	0.75	0.0471	0.99	0.65	0.0911	0.92	0.66
2008	-0.0772	0.89	0.94	-0.1102 **	0.90	0.94	-0.0826	0.83	0.86	-0.3229	0.82	0.90
2009	-0.1581	0.82	0.80	-0.0976 **	0.79	0.84	-0.1475	0.76	0.86	0.0513	0.72	0.21
2010	-0.2803	0.82	0.71	-0.186 ***	0.76	0.76	-0.2759	0.74	0.81	-0.2495	0.74	0.78
2011	-0.1914	0.99	0.86	-0.1459	0.98	0.88	-0.2683	0.86	0.87	-0.209 ***	0.84	0.85
2012	-0.188 ***	0.92	0.75	-0.0644 *	0.94	0.66	-0.2119	0.79	0.75	-0.2607	0.75	0.53
2013	-0.27 ***	0.63	0.46	-0.1268	0.60	0.50	-0.1943	0.52	0.54	-0.1771	0.57	0.37
2014	-0.127 ***	0.74	0.49	-0.0459	0.71	0.57	-0.1217	0.56	0.51	-0.103 ***	0.50	0.38

	Computer			Light Industry			Communication			Mining		
2005	-0.2374	1.19	0.49	-0.2132	1.22	0.62	-0.2944	1.22	0.47	-0.2083	1.18	0.60
2006	-0.0826	1.01	0.49	-0.1211 **	0.86	0.60	-0.0613	1.03	0.54	-0.0263	0.74	0.53
2007	0.0301	0.95	0.80	0.0294	0.90	0.82	-0.0304	0.85	0.75	0.0945	0.98	0.76
2008	-0.0777	0.88	0.95	-0.1966	0.90	0.94	-0.0754	0.88	0.81	-0.1571	0.97	0.93
2009	-0.1584	0.79	0.79	-0.199 ***	0.80	0.84	-0.0704	0.82	0.74	-0.0636	1.12	0.89
2010	-0.2474	0.79	0.70	-0.2077	0.75	0.79	-0.2063	0.77	0.71	0.0266	1.12	0.86
2011	-0.1241	0.94	0.84	-0.1854	0.88	0.87	-0.1176	0.96	0.81	-0.0465	1.18	0.89
2012	-0.1714	0.90	0.72	-0.1927	0.81	0.72	-0.1717	0.94	0.68	-0.1066	1.29	0.79
2013	-0.2236	0.72	0.39	-0.1955	0.57	0.48	-0.176 ***	0.73	0.40	-0.2114	0.76	0.65
2014	-0.0976 *	0.75	0.34	-0.1661	0.58	0.46	-0.1177	0.72	0.44	-0.1525	0.64	0.39

|	Ferrous Metal			Bank			Non-bank financial			Food & Beverage		
2005	-0.0499	0.98	0.59	0.1763 ***	1.35	0.57	-0.2788	1.13	0.44	-0.2525	1.08	0.65
2006	0.0199	0.73	0.59	0.0025	0.85	0.27	0.0004	0.94	0.45	0.0457	0.92	0.56
2007	0.1358 **	1.02	0.84	0.013	0.85	0.70	1.7272 ***	0.99	0.12	-0.0167	0.85	0.72
2008	0.1923 ***	0.96	0.95	0.1957 ***	1.09	0.94	-0.2377	1.00	0.90	-0.2134	0.87	0.94
2009	-0.1773	0.93	0.82	-0.1051	1.00	0.90	-0.05	0.94	0.87	-0.1157	0.73	0.81
2010	-0.1504	0.85	0.85	-0.0941 **	0.97	0.81	0.0973	1.12	0.31	-0.2298	0.68	0.75
2011	-0.0961 **	0.87	0.75	-0.0309	0.86	0.90	-0.0393	0.86	0.36	-0.2287	0.79	0.87
2012	-0.1333	0.73	0.56	-0.0049	0.68	0.68	0.0335	1.19	0.14	-0.2895	0.77	0.66
2013	-0.1843	0.53	0.47	0.0381	1.07	0.82	-0.1043 **	1.17	0.72	-0.2911	0.54	0.57
2014	-0.2293	0.47	0.41	-0.0206	0.84	0.72	0.0382	1.21	0.76	-0.1579	0.55	0.55
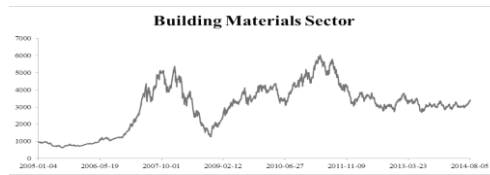
Fig. 3. Building Materials Sector Trend

4.2. SWS Primary Sector Index: Robustness Test

To explore the robustness of the SWS Primary Sector stocks' simple average results, we conduct another test using the SWS Primary Sector Indexes. The indexes are constructed using a weighted average method for constituent stocks of each sector. The only difference in the regression function is to replace $R_{i,t}$ which is the overnight return of simple average overnight return of stocks in sector i on day t, with $r_{i,t}$ denoting the overnight return of sector i's index on day t. We can see from Table 5 that for most sectors, the alpha returns of indexes are still negative with significance, and generally speaking the negative significance is even more stable through time. For example in the Commerce & Trade sector, the sector index alpha returns are all significantly negative while the constituent stocks' simple average has an insignificant alpha return in 2007. But some sector indexes went far away from the constituent stocks' simple average, such as the Communication sector and Food & Beverage sector. It is a reflection of the discrepancy of the simple average and the weighted average, which indicates that the results in some sectors are not as stable as others.

4.3. Application: Hedging Portfolios Construction in China's Stock Markets

Since there are obvious negative overnight alpha returns in some sectors, we can construct hedging portfolios to earn the absolute alpha returns. Let's take Catering & Tourism sector as an example. From the first day of 2013 if we borrowed the constituent stocks valuing 100,000 *RMB* with equal value weight near the close time and sold all of them every day, in the meanwhile we bought HS300 ETF with a value of 0.529 multiply 100,000 *RMB*, and next day we did all inverse transactions at the open, we could earn a positive alpha return of 18.55% at the end of the year. In 2013 the HS300 Index decreased 7.7%, which means that we got an excess return of about 26% compared with the market index. This is not a small return, although if we take consideration of the transaction costs the return rate might decrease, we earn much more than if we put the same amount of money in banks. This hedging strategy may get even higher payoffs in other sectors like Electronic Component or Food & Beverage, which provides more opportunities for investors to seek extra returns.

Table 5. SWS Primary Sector Indexes

year	alpha	beta	Rsquare	alpha	beta	Rsquare	alpha	beta	Rsquare	alpha	beta	Rsquare
	Transportation &			Catering & Tourism			Media			Public Utility		
2005	-0.1909	1.12	0.72	-0.3527	1.04	0.27	-0.1283	1.42	0.44	-0.1311	1.09	0.58
2006	-0.1276	0.66	0.41	-0.3044	0.94	0.24	-0.1393 *	0.76	0.23	0.0453	0.78	0.63
2007	-0.0946 *	0.98	0.87	-0.5414	0.92	0.50	-0.2654	0.92	0.68	0.1981	0.99	0.84
2008	-0.0182	0.95	0.95	-0.3437	0.96	0.84	0.0601	0.94	0.90	-0.0393	0.78	0.85
2009	0.0177	0.87	0.86	-0.2872	0.84	0.64	-0.0387	0.77	0.64	-0.0911	0.66	0.75
2010	-0.052 *	0.79	0.88	-0.2168	0.74	0.66	-0.1132	0.81	0.66	0.0046	0.65	0.80
2011	-0.0817	0.78	0.89	-0.1802	0.83	0.82	0.5569	0.93	0.67	-0.128	0.86	0.87
2012	-0.0742	0.74	0.81	-0.1138	0.71	0.50	-0.1599	0.93	0.60	-0.0747	0.71	0.80
2013	-0.0885	0.59	0.54	-0.1641	0.55	0.35	-0.2446	0.65	0.26	-0.0367	0.64	0.67
2014	-0.1305	0.69	0.58	-0.1125	0.74	0.41	-0.1717	0.73	0.29	-0.0026	0.58	0.60
	Agriculture			Chemical			Medical Biology			Commerce & Trade		

Year												
2005	-0.2697	0.98	0.56	-0.1909	1.17	0.80	-0.2685	0.96	0.64	-0.2765	1.03	0.59
2006	-0.3114	0.71	0.39	-0.2926	0.75	0.51	-0.0862	0.72	0.57	-0.2467	0.88	0.53
2007	-0.4615	0.93	0.63	-0.1731	0.99	0.88	-0.2897	0.93	0.80	-0.2764	1.01	0.85
2008	-0.3205	0.93	0.88	-0.2131	0.87	0.94	-0.1462	0.82	0.93	-0.3114	0.89	0.94
2009	-0.123 **	0.81	0.73	-0.1481	0.86	0.86	0.0026	0.59	0.62	-0.093	0.83	0.90
2010	-0.1648	0.83	0.69	-0.1073	0.89	0.89	-0.1992	0.68	0.69	-0.1191	0.79	0.86
2011	-0.1664	0.93	0.84	-0.1396	1.00	0.92	-0.1565	0.83	0.88	-0.1222	0.85	0.93
2012	-0.1326	0.91	0.73	-0.1084	0.94	0.85	-0.1705	0.77	0.78	-0.0996	0.87	0.82
2013	-0.1979	0.59	0.38	-0.1939	0.60	0.63	-0.1749	0.49	0.43	-0.1329	0.62	0.49
2014	-0.1851	0.49	0.30	-0.0999	0.74	0.66	-0.0762	0.64	0.65	-0.1179	0.79	0.63

Year	National Defense			Electrical Household			Building materials			Architectural decoration		
2005	-0.3476	1.10	0.32	-0.093 **	0.88	0.37	-0.2375	1.04	0.52	-0.1909	1.00	0.44
2006	-0.3155 *	1.04	0.06	-0.1236	0.71	0.39	-0.1443	0.84	0.43	-0.2453	0.68	0.23
2007	0.2687 **	0.74	0.51	-0.0913	0.91	0.64	0.298 ***	1.08	0.75	0	1.02	0.74
2008	0.0231	1.03	0.89	0.1643 *	0.86	0.86	-0.1069	1.02	0.89	-0.0113	0.97	0.91
2009	-0.1222	0.87	0.59	0.1095	0.74	0.59	0.0372	0.81	0.79	-0.026	0.79	0.86
2010	-0.4764	0.88	0.52	-0.0388	0.74	0.72	0.0213	0.81	0.66	-0.1464	0.74	0.81
2011	-0.049	1.02	0.76	-0.0772	0.94	0.89	-0.1891	1.13	0.89	-0.1218	0.90	0.90
2012	-0.0214	0.86	0.39	-0.019	0.89	0.62	-0.1187	1.15	0.69	-0.0772	0.91	0.79
2013	0.0948	0.67	0.22	0.0094	0.70	0.49	-0.0166	0.90	0.63	0.0198	0.76	0.77
2014	-0.063	0.78	0.19	-0.0715	0.91	0.48	0.0514	0.87	0.61	-0.0293	0.69	0.64

Year	Property			Nonferrous Metal			Machinery equipment			Car		
2005	-0.2051	1.14	0.63	-0.2029	1.17	0.63	-0.2211	0.98	0.57	-0.2689	1.09	0.50
2006	-0.3091	0.95	0.49	-0.4385	1.50	0.26	-0.2581	0.95	0.48	-0.127	0.83	0.48
2007	-0.385	1.04	0.83	-0.2994	1.07	0.76	0.0679	0.97	0.85	-0.0068	1.02	0.83
2008	-0.1826	1.05	0.92	-0.1584 *	0.98	0.86	-0.2718	0.93	0.90	0.2509	0.97	0.93
2009	-0.1988	0.95	0.86	-0.0988	1.54	0.71	-0.0835 *	0.83	0.81	0.0196	0.82	0.70
2010	-0.311	0.94	0.79	0.0403	1.43	0.72	-0.0951	0.84	0.79	-0.0304	0.82	0.67
2011	-0.2294	0.95	0.90	-0.0321	1.27	0.84	-0.2013	1.04	0.90	-0.1306	0.94	0.91
2012	-0.1646	1.09	0.76	-0.0064	1.48	0.66	-0.0873	1.01	0.84	-0.0777	0.88	0.79
2013	0.0026	1.08	0.55	-0.1318	0.84	0.53	-0.1741	0.69	0.64	-0.0755	0.81	0.71
2014	-0.1115	0.86	0.50	-0.0638	0.77	0.34	-0.1394	0.64	0.45	0.0184	0.83	0.41

Year	Electronic Component			Electric equipment			Textile & Clothing			Miscellaneous		
2005	-0.1688	1.14	0.48	-0.2013	1.00	0.53	-0.2723	1.07	0.46	-0.1628	1.00	0.54
2006	-0.2599	0.76	0.43	-0.2576	0.78	0.36	0.052	0.95	0.48	-0.2018	0.93	0.54
2007	-0.3717	0.95	0.78	-0.3258	0.87	0.58	0.0771	1.19	0.78	-0.4952	1.10	0.55
2008	-0.1345	0.89	0.92	-0.2683	0.91	0.88	0.0012	0.93	0.90	-0.2447	0.97	0.93
2009	-0.3036	0.84	0.76	0.0131	0.79	0.75	-0.2782	0.81	0.86	-0.1339	0.87	0.84
2010	-0.3077	0.84	0.73	-0.0164	0.79	0.68	-0.3029	0.77	0.83	-0.1896	0.80	0.73
2011	-0.1717	1.00	0.85	-0.0936	0.98	0.90	-0.2472	0.86	0.88	-0.1611	0.95	0.87
2012	-0.1576	0.92	0.78	-0.1392	0.88	0.70	-0.1875	0.79	0.76	-0.1389	0.80	0.61
2013	-0.262	0.66	0.49	-0.065	0.63	0.51	-0.1652	0.58	0.58	-0.1664	0.65	0.56
2014	-0.1308	0.72	0.50	0.0259	0.74	0.53	-0.1421	0.62	0.44	-0.0987	0.64	0.42

Year	Computer			Light Industry Manufacturing			Communication			Mining		
2005	-0.0827	1.01	0.36	-0.2118	1.01	0.41	-0.0485	0.91	0.31	-0.0721	1.13	0.35
2006	-0.1126	0.97	0.55	-0.0907	0.75	0.53	-0.1351 *	0.81	0.25	-0.0331	0.89	0.53
2007	0.0313	1.00	0.75	-0.2004	0.96	0.82	-0.0209	0.91	0.71	-0.0373	1.11	0.84
2008	0.0048	0.91	0.94	-0.1079 *	0.93	0.93	-0.01	0.94	0.78	-0.1616 *	1.04	0.89
2009	-0.0368	0.80	0.75	-0.2009	0.82	0.86	0.0653	0.76	0.65	-0.0567	1.27	0.85
2010	-0.2356	0.83	0.71	-0.1606	0.79	0.81	-0.1056	0.81	0.74	0.0881	1.35	0.84
2011	-0.1114	0.94	0.85	-0.2089	0.92	0.88	0.0313	0.97	0.85	0.0599	1.25	0.87
2012	-0.1331	0.89	0.75	-0.1868	0.83	0.74	-0.1656	0.86	0.57	0.0123	1.26	0.86
2013	-0.267	0.68	0.45	-0.2294	0.53	0.45	-0.1673	0.76	0.40	-0.1422	0.82	0.73
2014	-0.1724	0.71	0.28	-0.1652	0.58	0.44	-0.062	0.76	0.36	-0.1236	0.71	0.46

Year	Ferrous Metal			Bank			Non-bank financial			Food & Beverage		
2005	0.0014	1.02	0.47	0.3048	1.38	0.51	-0.0097	1.95	0.36	-0.2188	0.93	0.67
2006	-0.0444	0.72	0.50	-0.129	0.79	0.20	-0.0804	1.79	0.25	-0.731	0.97	0.27
2007	-0.1406	1.06	0.83	-0.0411	0.87	0.66	0.3162 *	1.11	0.54	-0.4239	0.86	0.73
2008	0.0881	0.95	0.91	0.1245	1.14	0.93	-0.1537	1.30	0.89	-0.2621	0.86	0.90
2009	-0.1893	0.88	0.79	-0.0536	0.99	0.83	0.1019 *	1.19	0.86	-0.0241	0.70	0.66
2010	-0.1154	0.83	0.80	-0.2178	0.87	0.44	0.1059 *	1.20	0.82	-0.0326	0.58	0.60
2011	-0.0899	0.94	0.82	0.0042	0.88	0.88	0.0964	1.24	0.92	-0.1405	0.70	0.82
2012	-0.0997	0.75	0.53	-0.0164	0.71	0.62	0.0418	1.41	0.89	-0.2169	0.77	0.44
2013	-0.1142	0.52	0.48	0.0049	1.27	0.83	0.0736	1.36	0.79	-0.2347	0.63	0.41
2014	-0.1865	0.54	0.28	-0.0609 *	0.99	0.68	0.037	1.33	0.66	-0.0845 *	0.81	0.45

5. Conclusion & Future Research

This paper pays attention to only overnight returns, pointing out that China's stock markets are characterized by significantly negative overnight returns which is contrast to the results of previous research indicating there exist positive overnight returns using HS300 Index. Through the overnight return statistics of HS300 Index and four boards of China's security markets we find that from the start of 2005 to Aug 7th, 2014, overnight returns are negative significantly across different markets and decrease with market size increasing. We also calculate SSE50 Index overnight returns to prove there is negative correlation between market size and the magnitude of overnight returns. However in bull years the overnight returns are slightly positive or not significantly negative, indicating that the market trends may influence overnight performance. Then we examine the overnight returns taken out of market effects by classifying stocks into various sectors according to SWS Primary Sector. The 28 sectors mostly show negative alpha returns, but there are sectors such as Bank making it in shortage of evidence to prove obvious alpha returns. We use the SWS sector indexes to conduct the robustness test, and it is proved that there exist a few sectors performing unstable.

We have several interesting directions for future research related to overnight returns. First is to further explore the specific relationship between market size and the magnitude of overnight returns and give insight to the behavioral financial reasons. Secondly we observed that the bull market effects are so strong that the overnight returns turned insignificant or even slightly positive, so what is the specific difference between the overnight information in bull market and bear market which results in different overnight returns? And we could also concentrate on a given sector to see if there is any other factor resulting in the significant alpha returns besides market returns? For example, since market size has something with the overnight returns, can we use the market value or shares outstanding as factors to explain the alpha returns? We are making efforts to answer these questions.

References

[1] Del Corral., D. Colwell, D. Michayluk, and L, Woo. News Releases When Markets are Closed. Unpublished Working Paper. University of Technology Sydney, 2003.

[2] Barber, B M,Odean T.. All that Glitters: The Effect of Attention and News on the Buying Behavior of Individual and Institutional Investors. *Review of Financial Studies*, 2008; **21**:785–818.

[3] Ahoniemi Katja and Lanne Markku. Overnight Stock Returns and Realized Volatility. *International Journal of Forecasting,* Forthcoming. , 2013.Available at SSRN: http://ssrn.com/abstract=1945687 or http://dx.doi.org/10.2139/ssrn.1945687

[4] Brock A. and W. Kleidon, Periodic Market Closure and Trading Volume. *Journal of Economic Dynamics and Control*, 1992; **16**:51-89.

[5] Henk Berkman, Paul D. Koch, Laura Tuttle, and Ying Jenny Zhang. Paying Attention: Overnight Returns and the Hidden Cost of Buying at the Open. *Journal of Financial and Quantitative Analysis*, ,2012;**47**(4):715-741.

[6] Branch, B., and A. Ma. The Overnight Return, One More Anomaly. Working Paper, University of Massachusetts, available at http://ssrn.com/abstract=937997 (2008).

[7] Liu HZ,.He WZ. Overnight effect and noon effect of China's security markets. *Journal of Financial Research*, 2012.2:155-167.

[8] He L., Zhao YD. Empirical study of Overnight effect and noon effect for HS300 Index. *Shanghai Management Science*, 2013; **35**(5):61-64.

[9] Bernard, VL. Cross-Sectional Dependence and Problems in Inference in Market-Based Accounting Research. *Journal of Accounting Research*, 1987;**25**: l–48.